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policy, development and innovation

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Advancing Utah's Energy Future

Changing Energy Landscape: A Few Considerations

- **Local Air Quality Concerns**
- **Changing Electricity Sector**
  - Plant retirements – coal and nuclear
  - Substantial growth in distributed energy resources (e.g., rooftop solar)
- **Transmission Regionalization**
  - Energy Imbalance Market (EIM)
  - CAISO Expansion
- **Emerging Storage Technologies**
- **Electric Vehicles**
- **Community Choice Initiatives**

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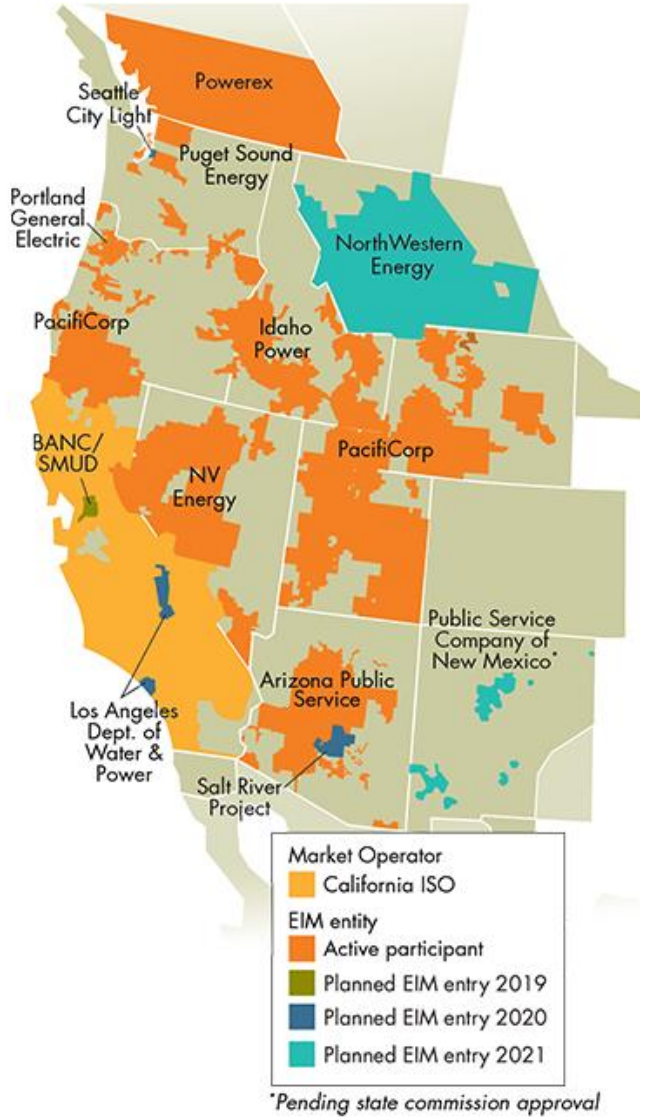
Energy Imbalance Market

- **Energy Imbalance Market (EIM) Expansion**
  - The Western EIM began operation in 2014 with the California Independent System Operator (CAISO) operating the 15-minute and 5-minute real-time energy market and PacifiCorp being the first new participant
  - Today, current and planned EIM entities cover >70% of all load in the Western Interconnection
  - Other entities expressing interest in joining include, PNM, BPA, and Northwestern Energy
- **EIM provides benefits**
  - Provides a liquid market to sell excess energy and to purchase energy (in real time)
  - While the market name implies it an “imbalance” (deviations of supply and demand from forecasted levels), and in operation it economically re-dispatches in real-time the generation from participating entities generation in real-time



Credit: Energy Strategies, LLC

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Extended Day-Ahead Market

- **The CAISO has put forward a potential stakeholder initiative which would extend the day-ahead market to EIM Entities, being referred to as the Extended Day-Ahead Market or "EDAM"**
  - Framework would be similar to the current EIM, but rather than only addressing dispatch in the 15-minute and 5-minute timeframe, would include day-ahead unit commitment and dispatch
- **The EIM Entities are currently conducting a Feasibility Assessment of EDAM**
- **If the Feasibility Assessment indicates benefits, the EIM Entities will likely ask CAISO to begin its stakeholder initiatives on EDAM**
- **CAISO's current schedule for this initiative would have EDAM go live in the Fall of 2021**

Credit: Energy Strategies, LLC

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Full CAISO Regionalization

- **In 2015, PacifiCorp announced its intention to join the CAISO as a full Participating Transmission Owner**
- **This initiated a process of evaluating changes that would be needed to enable PacifiCorp's entrance into CAISO**
- **In California, SB350 was passed which laid out a potential path to transforming the CAISO into a regional organization (with a new governance structure)**
  - The bill, in part, required the CAISO to conduct studies on the impacts of a regional market
- **Other bills in California have also explored modifications to the governance structure of CAISO but none have been passed**
  - Seems unlikely that another governance bill will be considered in 2019

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U.S. Department of Energy Grant for RTO Study

- **The U.S. DOE awarded OED nearly $500,000 to study Regional Transmission Operator (RTO) options in the West.**
  - First-of-its kind neutral analysis in a neutral forum
  - All Western States are engaged in the project (OR, WA, CA, ID, NV, NM, AZ, WY, MT, UT)
  - Project kickoff meeting held April 16, 2019

Project Goals:

- **Convene Western states** to discuss Regional Transmission Organizations (RTOs) or other market expansion options.
- **Model impacts of Western RTO options** for up to three (3) RTO 'footprints' across the Western Interconnection.
- **Define RTO governance needs.** Define the steps necessary in each state to join a Western RTO or alternative.
- **Create an RTO scorecard** to inform future market expansion actions for states via legislative or regulatory action.

Project Outcomes:

The project will result in a **Roadmap** that defines a state-led approach to regional planning. Impacts from a successful regional collaboration are expected to include:

- Opportunities for implementation of effective state energy policies.
- A more resilient and reliable grid with improved transmission capacity.

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Changing Energy System Dynamics: Storage

- **Energy storage offers a unique opportunity to dynamically manage supply and demand while maximizing the value of grid resources. By deploying storage in strategic locations, utilities can more effectively manage their energy portfolios.**
  - Storage can provide management of intermittent demand – helping to flatten peak demand requirements for the utility.
  - Second, the responsiveness of energy storage can allow the utility to implement voltage regulation and other ancillary services, which are useful for improving system efficiency.
  - Third, storage can dispatch power to better integrate intermittent resources like renewable energy.
- **As of 2018, the US had more than 25 GW of electrical energy storage capacity**
- **Utah has played a crucial leadership role in energy storage and innovation**
  - In 2019, the Utah Legislature passed SB 24, updating State Energy Policy to specifically include promoting the development of energy storage.
- **Utah also has a unique energy storage opportunity**

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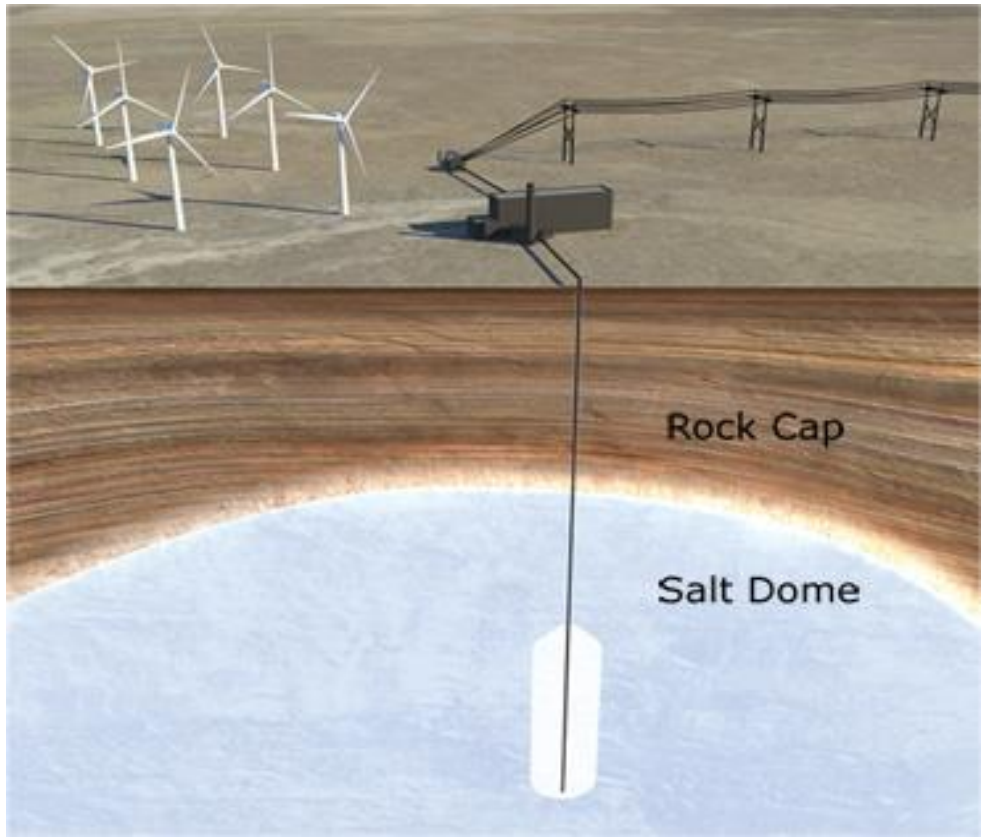
Types of Energy Storage

- Lithium Battery
- Compressed Air
- Underground Salt Domes
- Spinning Flywheels
- Pumped Hydro



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Battery Cost

- The largest R&D storage investments are in lithium based batteries
- Lithium costs are declining due to ongoing development in consumer electronics and electric vehicles
- **Battery costs are less than $230 per kWh in 2016, compared to $1,000 per kWh in 2010**

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Concluding Comments

- **The energy ecosystem in the West is changing**
  - Consumer preferences
  - Changing cost of resources
  - Access to regional markets

- **OED continues to collaborate with other state agencies, utilities, and the private sector to promote the state's wise all-of-the-above approach to energy resources**
  - New markets opportunities, innovative resources are being considered in the context of effectively utilizing energy systems to promote affordable, reliable energy for Utah's residents and businesses

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Powering Utah's Energy Future

Questions?

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